

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA7 | Colne Valley

**Data appendix (AG-001-007)**

Agriculture, forestry and soils

November 2013

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Department  
for Transport

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# 1 Introduction

1.1.1 The agriculture, forestry and soils appendix for the Colne Valley community forum area (CFA7) comprises:

- soils and Agricultural Land Classification (ALC) surveys (Section 2);
- forestry (Section 3); and
- farm impact assessment summaries (Section 4).

1.1.2 Maps referred to throughout the agriculture, forestry and soils appendix are contained in the Volume 5, Agriculture, Forestry and Soils Map Book.

## 2 Soils and Agricultural Land Classification surveys

### 2.1 Background

- 2.1.1 The agricultural baseline data has been derived from both desk study and site investigation. Information gathered by the desk study has related primarily to the identification of soil resources in the study area, the associated physical characteristics of geology, topography and climate which underpin the assessment of agricultural land quality, and the disposition of land uses. The main sources of information have included:
- National Soil Map<sup>1</sup>;
  - Soils and Their Use in South East England<sup>2</sup>;
  - solid and superficial deposits from the Geology of Britain viewer<sup>3</sup>;
  - gridpoint meteorological data for agricultural land classification of England and Wales<sup>4</sup>;
  - Provisional Agricultural Land Classification of England and Wales (1:250,000)<sup>5</sup>;
  - Likelihood of Best and Most Versatile Agricultural Land (1:250,000)<sup>6</sup>;
  - agri-environment schemes<sup>7</sup>;
  - computer aided light detection and ranging (LiDAR) elevation data for determination of gradient; and
  - aerial photography.
- 2.1.2 Where the collection of agricultural site information has enabled a review/refinement of published information, this was undertaken in accordance with the methodology prescribed by the Ministry of Agriculture, Fisheries and Food (MAFF)<sup>8</sup>.
- 2.1.3 Engagement with landowners and tenants between May 2012 and June 2013 has established the nature and extent of agricultural, forestry and related rural enterprises. Information obtained from farm impact assessment interview surveys has been taken as a factual representation of local agricultural and forestry interests and has not been subject to further evaluation.

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<sup>1</sup> Cranfield University (2001), *The National Soil Map of England and Wales* 1:250,000 scale.

<sup>2</sup> Soil Survey of England and Wales (1984), *Soils and Their Use in South East England*.

<sup>3</sup> British Geological Survey. <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>: Accessed on 18 March 2013

<sup>4</sup> Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

<sup>5</sup> Ministry of Agriculture, Fisheries and Food (MAFF), (1983), *Agricultural Land Classification of England and Wales* (1:250,000).

<sup>6</sup> Department for Environment, Food and Rural Affairs (Defra) (2005), *Likelihood of Best and Most Versatile Agricultural Land* (1:250,000).

<sup>7</sup> Multi-Agency Geographical Information for the Countryside (MAGIC) available on line @ [www.magic.gov.uk](http://www.magic.gov.uk), accessed August 2013.

<sup>8</sup> MAFF, (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

## 2.2 Soils and land resources

- 2.2.1 The location and extent of soil types displaying different characteristics and of agricultural land in the different ALC grades are influenced by topography, drainage, geology and soil parent material, which are described in turn below. This section then provides a description and distribution of the main soil types encountered along the study corridor.
- 2.2.2 The main soil and land use interactions are then evaluated and include agricultural land quality and other key soil interactions along the route within this study area.

### Topography and drainage

- 2.2.3 The main topographical features of the study area are the water bodies of the River Colne, the Grand Union Canal and the lakes formed in the valley floor on former gravel extraction sites. These water bodies are found at around 40m above Ordnance Datum (AOD). From the river the valley sides rise gently reaching around 80m AOD at the tunnel portal just east of the M25.

### Geology and soil parent materials

- 2.2.4 The majority of the study area is underlain by clay, silt and sand of the Lambeth Group and London Clay Formation. These units are dissected by sedimentary Chalk bedrock which runs north to south in association with the water courses.
- 2.2.5 Across most of the section superficial deposits of Taplow, Gerrards Cross and Shepperton Gravels derived from rivers overlie the bedrock geology. A list of geological strata occurring within the study area is provided in age order in Table 1 and shown on Map WR-02-07 (Volume 5, Water Resources Map Book).

Table 1: Bedrock and soil forming materials

Formation	Composition/soil parent material
Lambeth Group	Fine grained sands, silts and clays with localised pebble beds
London Clay	Fine, sandy, silty clay/silty clay. Glauconitic at base
Superficial deposits	
Taplow Gravel	Sand and gravel, locally with lenses of silt, clay or peat
Gerrards Cross Gravel	Sand and gravel, locally with lenses of silt, clay or peat and organic material
Shepperton Gravel	Gravel with clay and sand
Taplow Gravel	Sand and gravel, locally with lenses of silt, clay or peat

### Description and distribution of soil types

- 2.2.6 The characteristics of the soils are described by the Soil Survey of England and Wales<sup>2</sup> and shown on the National Soil Map<sup>1</sup>. The soils are grouped into associations of a range of soil series showing similar characteristics.

- 2.2.7 The National Soil Map shows the study area to have two distinct soil types:
- to the east of the Grand Union Canal the soils are described as slowly permeable, seasonally wet acid or slightly acid loamy and clayey soils;
  - to the west the soils are described as freely draining slightly acid loamy soils.
- 2.2.8 The soils mapped by the Soil Survey of England and Wales vary from south-east to north-west along the Proposed Scheme, including the Wickham 4, Park Gate, Essendon and Marlow associations. These soils become increasingly better drained from south-east to north-west.
- 2.2.9 Wickham 4 and Essendon soils are mapped to the east of the Grand Union Canal and Broadwater Lake nature reserve. These are characterised by fine silty or loamy topsoils overlaying clay subsoils and are poorly to imperfectly drained. The Essendon soils are slightly to moderately stony and have a larger sand component in upper horizons. Sonning 1 soils are also mapped to the east of the canal but contrast with the other soil characteristics in that they are stony and coarse textured occurring on very steep slopes.
- 2.2.10 The canal itself and surrounding wetlands are marked by alluvial soils of the Fladbury 3 and Frome associations. These profiles are typified by silty and clayey soil textures. Fladbury 3 soils tend to be stoneless, whereas Frome soils become increasingly stony with depth.
- 2.2.11 Adjacent to the Frome association the Park Gate and Hamble 2 associations are mapped over the flattest land in the section. Both soils develop over river terrace deposits and are typically deep, stoneless and silty. The Hamble 2 soils, although close to the waterway on low lying land, are well drained due to underlying gravels. Park Gate soils are typically seasonally waterlogged.
- 2.2.12 Marlow soils are mapped extensively to the west, with intrusions of Wick 3 and Coombe 1 soils from the north. All are developed in ancient river terrace drift, which gives rise to their fine loamy or silty over clayey properties. The soils become chalky or sandy at depth and are well drained. Typical profiles of the dominant soil series are given in Table 2 with references to soil colours having been derived from a standard Munsell Soil Colour Chart<sup>9</sup>.

Table 2: Profile description of dominant soil series

Wickham series	Park Gate series	Marlow series	Coombe series	Essendon series
ocm-22cm, dark greyish brown (10YR4/2) <sup>10</sup> very slightly stony silty clay loam with few fine greyish brown (10YR5/2) mottles; medium subangular	ocm-30cm, brown (10YR5/3) stoneless silty clay loam with common fine strong brown (7.5YR5/6) mottles; moist; massive; medium packing density; very	ocm-28cm, dark brown (10YR3/3) moderately stony sandy clay loam; medium subangular and platy flint; moist; moderately developed fine angular blocky; medium packing	ocm-25cm, dark brown (10YR3/3) slightly stony silty clay loam; medium angular flint; moist; strongly developed medium packing density; moderately weak soil and ped	ocm-8cm, black (7.5YR2/1) stoneless loamy peat; very moist; moderately developed coarse granular; low packing density; common medium woody roots and

<sup>9</sup> Munsell Color (2000), *Munsell Colour Charts*, Munsell Color, Grand Rapids, MI, USA.

<sup>10</sup> Munsell colour notation describes colour by three attributes: hue (with five principal colours - red (R), yellow (Y), green (G), blue (B), and purple (P) with a preceding intermediate value 2.5-10; value or brightness where zero is black (most dark) and ten is white (most light); and chroma that distinguishes the difference from a pure hue to a grey shade.



<b>Wickham series</b>	<b>Park Gate series</b>	<b>Marlow series</b>	<b>Coombe series</b>	<b>Essendon series</b>
and tabular chert; moist; moderately developed medium subangular blocky; medium packing density; moderately firm soil strength; many very fine fibrous roots; non-calcareous; clear wavy boundary	firm soil strength; many fine fibrous roots; very slightly calcareous; abrupt wavy boundary	density; moderately weak soil strength; many fine fibrous roots; non-calcareous; abrupt smooth boundary	strength; many very fine fibrous roots; very calcareous; sharp smooth boundary	bracken rhizomes; non-calcareous; sharp smooth boundary
22cm-45cm, brown (10YR5/3) slightly stony silty clay loam with many fine strong brown (7.5YR5/6) mottles; medium subrounded and tabular chert; very moist; weakly developed; adherent coarse subangular blocky with light brownish grey (2.5Y6/2) faces; medium packing density; moderately firm soil and ped strength; common very fine fibrous roots; non-calcareous; few rounded ferruginous concretions; gradual wavy boundary	30cm-40cm, light brownish grey (2.5Y6/2) stoneless silty clay loam with many fine strong brown (7.5YR5/6) mottles; moist; very weakly developed medium prismatic; medium packing density; moderately firm soil and ped strength; few very fine fibrous roots; non-calcareous; few irregular ferri-manganiferous nodules; clear smooth boundary	28cm-48cm, brown (7.5YR5/2) slightly stony sandy clay loam; medium subangular and platy flint; moist; moderately developed fine angular blocky; medium packing density; moderately weak soil strength; common fine fibrous roots; non-calcareous; few ferrimanganiferous nodules; common clay coats; abrupt smooth boundary	25cm-44cm, brown to dark brown (7.5YR4/4) moderately stony silty clay loam; very small subrounded chalk; moist; strongly developed fine subangular blocky; medium packing density; moderately weak soil and ped strength; common very fine fibrous roots; very calcareous; abrupt irregular boundary with fine chalk gravel in the bottom of tongues	8cm-25cm, light brownish grey (10YR6/2) moderately stony fine sandy silt loam with common medium brown to dark brown (7.5YR4/2) and yellowish brown (10YR5/6) mottles; medium rounded flint; very moist; weakly developed medium subangular blocky; low packing density; moderately firm soil strength; common medium woody roots; non-calcareous; clear smooth boundary
45cm-65cm, light grey (5Y7/1) slightly stony silty clay with many fine strong brown (7.5YR5/8) mottles; medium subangular and tabular chert; very moist; weakly developed; adherent medium prismatic; high packing density; moderately firm soil and ped strength; few fine fibrous roots; very slightly calcareous; gradual wavy boundary	40cm-75cm, brown (7.5YR5/3) stoneless silty clay loam with very many medium strong brown (7.5YR5/6) and light brownish grey (10YR6/2) mottles; moist; weakly developed medium prismatic with light brownish grey (10YR6/2) faces; medium packing density; moderately firm soil and ped strength; few very fine fibrous roots; very slightly to slightly calcareous; common irregular ferri-manganiferous nodules; common clay coats; clear smooth	48cm-86cm, yellowish red (5YR5/6) moderately stony clay; medium subangular and platy flint; moist; strongly developed medium angular blocky with brown (7.5YR5/4) faces; medium packing density; moderately firm ped strength; common fine fibrous roots; non-calcareous; common soft ferri-manganiferous concentrations; many clay coats; gradual smooth boundary	44cm-80cm, very pale brown (10YR7/4) moderately stony sandy silt loam; very small subrounded chalk with some large patches with medium chalk fragments and large flints; moist; massive; medium packing density; moderately strong soil strength; extremely calcareous	25cm-40cm, light brownish grey (2.5Y6/2) slightly stony clay loam with many medium strong brown (7.5YR5/8) mottles; medium rounded flint and quartz; wet; moderately developed coarse angular blocky; medium packing density; moderately firm soil strength; common medium woody roots; non-calcareous; clear wavy boundary

Wickham series	Park Gate series	Marlow series	Coombe series	Essendon series
	boundary			
65cm-110cm, light grey to grey (5Y6/1) stoneless silty clay with many fine strong brown (7.5YR5/8) mottles; moist; weakly developed, adherent coarse prismatic; high packing density; very firm soil and ped strength; very slightly calcareous	75cm-90cm, brown (7.5YR5/4) very slightly stony silty clay loam with very many coarse light brownish grey (2.5Y6/2) and strong brown (7.5YR5/6) mottles; small angular and rounded flint; moist; massive; high packing density; moderately weak soil strength; few very fine fibrous roots; very calcareous; few rounded calcareous nodules; common clay coats; clear smooth boundary	86cm-102cm, reddish brown (5YR5/4) moderately stony clay; medium subangular and platy flint; moist; strongly developed fine angular blocky with yellowish red (5YR5/6) faces; medium packing density; moderately firm ped strength; few fine fibrous roots; non-calcareous; many ferri-manganiferous concretions; many clay coats; abrupt wavy boundary	No record below 80cm	40cm-65cm, strong brown (7.5YR5/8) slightly stony clay with many medium grey (5Y5/1) and red (2.5YR5/8) mottles; medium rounded flint and few quartz; wet; strongly developed coarse angular blocky with grey (10YR5/1) faces; high packing density; moderately firm ped strength; common fine woody roots; non-calcareous; gradual smooth boundary
	90cm-118cm, light grey (5Y7/1) very slightly stony silty clay loam with many coarse strong brown (7.5YR5/8) mottles; small flint; wet; massive; medium packing density; moderately firm soil strength; few very fine fibrous roots; slightly calcareous; few rounded calcareous nodules	102cm-110cm, light brown (7.5YR6/4) slightly stony silty clay loam; small subrounded, chalk; moist; massive; high packing density; very firm soil strength; few fine fibrous roots; very calcareous		65cm-95cm, strong brown (7.5YR5/8) slightly stony clay with many medium grey (5Y5/1) and common medium red (2.5YR4/8) mottles; medium rounded flint; wet; strongly developed coarse angular blocky with grey (5Y5/1) faces; high packing density; moderately firm ped strength; few medium woody roots; non-calcareous

## 2.3 Soil and land use interactions

### Agricultural land quality

- 2.3.1 A review of background ALC information has been undertaken to ascertain the land quality context within the study area. The review has also established the extent of existing detailed post-1988 ALC information to ensure that surveys are not repeated unnecessarily.
- 2.3.2 A number of detailed post-1988 ALC surveys have been undertaken in the area and therefore this section was not identified as needing further surveys. Detailed borehole logs were available for a survey of 14ha at Pynesfield, which is within the study area to the west of the Colne Valley. This survey revealed profiles typically comprising medium clay loam topsoils overlying silty clay loam or clay subsoils. Occasional profiles had a slowly permeable subsoil horizon but the main limitation to the grading

was droughtiness, which restricts the soils to Subgrade 3a or Grade 2 across a majority of the site. The severity of a droughtiness limitation is calculated according to the methodology given in Figure 1.

Figure 1: Methodology for calculating the severity of droughtiness limitation to ALC grading<sup>11</sup>

$$AP \text{ wheat (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{50}) + \sum (EA_{vs} \times LT_{50-120})}{10}$$

where

$TA_{vt}$  is Total available water ( $TA_v$ ) for the topsoil texture

$TA_{vs}$  is Total available water ( $TA_v$ ) for each subsoil layer

$EA_{vs}$  is Easily available water ( $EA_v$ ) for each subsoil layer

$LT_t$  is thickness (cm) of topsoil layer

$LT_{50}$  is thickness (cm) of each subsoil layer to 50 cm depth

$LT_{50-120}$  is thickness (cm) of each subsoil layer between 50 and 120 cm depth

$\Sigma$  means 'sum of'.

$$AP \text{ potatoes (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{70})}{10}$$

where

$LT_{70}$  is thickness (cm) of each subsoil layer to 70 cm depth

**MB (Wheat) = AP (Wheat) - MD (Wheat)**

**MB (Potatoes) = AP (Potatoes) - MD (Potatoes)**

Where

MB is the Moisture Balance

AP is the Crop-adjusted available water capacity

MD is the moisture deficit, as determined by the agro-climatic assessment.

**Table 8      Grade according to droughtiness**

Grade/ Subgrade	Moisture Balance limits (mm)		
	<i>wheat</i>		<i>potatoes</i>
1	+30	<i>and</i>	+10
2	+5	<i>and</i>	-10
3a	-20	<i>and</i>	-30
3b	-50	<i>and</i>	-55
4	<-50	<i>or</i>	<-55

<sup>11</sup> Derived from: MAFF (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

## Desk assessment

- 2.3.3 Areas of the Colne Valley CFA which have not been surveyed in detail have been subject to desk-based assessment. The available information on which this assessment has relied primarily relates to mapping of soil types, topography and agro-climatic data. Interpretation of these data sources and the interactions between them allowed for an assessment of the likely soil textures, soil drainage status, landform, gradient, presence of or depth to poorly permeable soil layers and the extent to which crop growth may be limited by soil droughtiness.
- 2.3.4 A professional judgement has then been made of the likely predominant ALC grade for a soil with the characteristics found in the climatic zone of the location within the route section. The judgement is influenced by the surveyor's experience of previous surveys in the locality and on similar soil types. The resulting grade is that which is considered to be the most likely grade that would be found should a detailed site investigation be conducted, although this does not mean in all cases that the grade will be found in practice.
- 2.3.5 Context land quality was ascertained using information derived from the provisional ALC maps of England and Wales produced by MAFF in the 1960s and 1970s<sup>5</sup>. These maps show the section to be provisionally mapped as Grade 3 with some Grade 2 to the north. These maps were originally published at a scale of 1:63,360 and are available at a scale of 1:250,000 in paper and digital formats. These maps were published at strategic scales only and based on a methodology that has since been revised twice and cannot be used definitively to classify individual sites and analysis of other information sources is necessary.

## Agro-climatic data

- 2.3.6 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point data set for three points within CFA7, which are set out in Table 3. The data show the area to be moderately warm (with an accumulated temperature range of 1,440 to 1,453 day°C) and average annual rainfall of approximately 690mm per year. The average number of field capacity days (FCD) is 145 which is marginally lower than the average for lowland England and is considered to be favourable for providing opportunities for agricultural land working.

Table 3: Local agro-climatic conditions

Agro-climatic parameter	West Ickenham	Denham	M25
Altitude (AOD)	50m	50m	80m
Average annual rainfall	689mm	690mm	693mm
Accumulated temperature above 0°C	1,452 day°	1,453 day°	1,440 day°
Field capacity days	143 days	145 days	146 days
Average moisture deficit, wheat	109mm	109mm	107mm
Average moisture deficit, potatoes	103mm	102mm	100mm

### *Site limitations*

- 2.3.7 The assessment of site factors is primarily concerned with the way in which topography influences the use of agricultural machinery and hence the cropping potential of land. Gradient and microrelief, with complex changes of slope angle or direction over short distances, are not considered limiting in this section of the Proposed Scheme.
- 2.3.8 Flooding is limited to the floodplains of the River Colne and its tributaries and the valley occupied by the Grand Union Canal. Flooding has the potential to downgrade agricultural land to Subgrade 3b or Grade 4 based on the frequency and duration of flooding.

### *Soil limitations*

- 2.3.9 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops, drainage, workability and trafficability.
- 2.3.10 There are two distinct soil characteristics within the study area:
- the fine loamy textures around the water bodies which are slowly permeable and wet; and
  - the similarly textured, but better draining soils on hill and valley sides.

### *Interactive limitations*

- 2.3.11 The physical limitations which result from interactions between climate, site and soil are soil wetness, droughtiness and susceptibility to erosion. Each soil can be allocated a Wetness Class (WC) based on soil structure, evidence of waterlogging and the number of FCD; the topsoil texture then determines its ALC Grade according to Table 6 of the MAFF ALC guidelines (see Figure 2).
- 2.3.12 Overall, the deep clay loam or silty clay loam Wickham 4 and Park Gate soils are moderately to poorly permeable and can be moderately to poorly drained (WC III or IV). Under the local climatic conditions, the typical soil profile is classified as Subgrade 3b. Where the Wickham 4 and Park Gate soils have a medium silty clay loam topsoil texture, they are assessed as Subgrade 3a and where calcareous Park Gate and Coombe 1 soils are found, the grading improves to Subgrade 3a or Grade 2 for heavy and medium silty clay loam topsoils respectively.
- 2.3.13 The typical soil profile for the Marlow soils (Table 2) demonstrates a slight droughtiness limitation to Grade 2. The profiles are permeable and typical of WC I but water retention by the clay components of the soil profile ensure that droughtiness is not severe.
- 2.3.14 The Essendon series profile description shows soil to have evidence of waterlogging and poor permeability from 8cm depth and places the soil into WC IV which, in combination with the sandy loam or sandy clay loam topsoil, results in a limitation to Subgrade 3a.

Figure 2: ALC grade according to soil wetness <sup>12</sup>

Wetness Class	Texture <sup>1</sup> of the top 25 cm	Field Capacity Days				
		<126	126-150	151-175	176-225	>225
I	S <sup>2</sup> LS <sup>3</sup> SL SZL	1	1	1	1	2
	ZL MZCL MCL SCL	1	1	1	2	3a
	HZCL HCL	2	2	2	3a	3b
	SC ZC C	3a(2)	3a(2)	3a	3b	3b
II	S <sup>2</sup> LS <sup>3</sup> SL SZL	1	1	1	2	3a
	ZL MZCL MCL SCL	2	2	2	3a	3b
	HZCL HCL	3a(2)	3a(2)	3a	3a	3b
	SC ZC C	3a(2)	3b(3a)	3b	3b	3b
III	S <sup>2</sup> LS SL SZL	2	2	2	3a	3b
	ZL MZCL MCL SCL	3a(2)	3a(2)	3a	3a	3b
	HZCL HCL	3b(3a)	3b(3a)	3b	3b	4
	SC ZC C	3b(3a)	3b(3a)	3b	4	4
IV	S <sup>2</sup> LS SL SZL	3a	3a	3a	3b	3b
	ZL MZCL MCL SCL	3b	3b	3b	3b	3b
	HZCL HCL	3b	3b	3b	4	4
	SC ZC C	3b	3b	3b	4	5
V	S LS SL SZL	4	4	4	4	4
	ZL MZCL MCL SCL	4	4	4	4	4
	HZCL HCL	4	4	4	4	4
	SC ZC C	4	4	4	5	5
Soils in Wetness Class VI - Grade 5						

<sup>1</sup>For naturally calcareous soils with more than 1% CaCO<sub>3</sub> and between 18% and 50% clay in the top 25 cm, the grade, where different from that of other soils, is shown *in brackets*

<sup>2</sup> Sand is not eligible for Grades 1, 2 or 3a

<sup>3</sup> Loamy sand is not eligible for Grade 1

Where S = sand, Z = silt, C = clay, L = loamy and P = peat.

For sand the coarseness of the grain is sub-divided into coarse (c), medium (m) and fine (f). The subdivisions of clay loam and silty clay loam classes are indicated as medium (M) (less than 27% clay); heavy (H) (27-35% clay).

The average number of FCD in the Colne Valley area is 145 and shown in the highlighted column

<sup>12</sup> Derived from: MAFF (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

### 3 Forestry

- 3.1.1 Data on the forestry resources in the study area has primarily been derived from the National Forest Inventory<sup>13</sup>. The area of land under forestry (i.e. trees and woodland) within 2km either side of the route centre line has been derived using Geographic Information System (GIS), and is shown in Table 4.
- 3.1.2 Forestry resources are predominantly south of the Proposed Scheme comprising a number of blocks of woodland around the flooded gravel pits, west of the Broadwater Lake reserve and including one classified as ancient woodland.

Table 4: Area of woodland within the Colne Valley study area

	Area of forestry land (ha)	Percentage of forestry (%)
Forestry land in 4km-wide study area	512	19% (forestry as a land use within 4km-wide study area)
Total forestry land within construction boundary	24.9	Approximately 7% of the land required for the construction of the Proposed Scheme is presently wooded

<sup>13</sup> Forestry Commission (2001), *National Forest Inventory Woodland and Ancient Woodland* (as updated).

## 4 Assessment of effects on holdings

- 4.1.1 The effects on holdings have been assessed through a series of interviews with farmers along the proposed route carried out between May 2012 and June 2013, as well as measurements of the applicable area of land required, according to the methodology set out in the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5, Appendix CT-001-000/2).
- 4.1.2 The nature of impacts considered comprises the temporary and permanent land required from the holding, the temporary and permanent severance of land, the permanent loss of key farm infrastructure and the imposition of disruptive effects (particularly noise and dust) on land uses and the holding's operations. These impacts occur primarily during the construction phase of the Proposed Scheme and are set out in Table 5.

Table 5: Summary of assessment of effect on holdings

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
CFA07/1 Park Lodge Farm 240ha dairy farm High sensitivity to change	Land required: 87.1ha (36%), but approximately 16.5ha is unsuited to agriculture due to ground contamination so the effective loss is 70.6ha (29%). High impact.	Land required: 43.8ha (18%). This will include 16.5ha of agricultural land that is presently contaminated and the restoration process could remedy the contamination. In such circumstance the effective operational size of the holding will be increased to 212.7ha and reduces the impact on the holding. Medium impact.
	Severance: during sustainable placement workings there would be considerable severance to the east but some of this land is unsuited to cropping or grazing due to ground contamination therefore limited severance. Low impact.	Severance: no agricultural land remains severed. Negligible impact.
	Disruptive effects: construction noise and dust controlled via the mitigation measures set out within the draft Code of Construction Practice <sup>14</sup> (CoCP). Negligible impact	Infrastructure: no buildings or other farm infrastructure affected. Negligible impact
	Overall temporary assessment: major effect due to the proportion of the holding removed and high sensitivity.	Overall permanent assessment: major/moderate effect due to the proportion of the holding removed and high sensitivity.
CFA07/2 Home Farm 1,200ha arable and beef cattle Medium sensitivity to change	Land required: 161ha (13%). Medium impact.  Severance: holding severed but accessible from public highway. Medium impact.  Disruptive effects: construction noise and dust controlled via the mitigation measures set out within the draft	Land required: 94.2ha (8%). Land located a long way distant from the main farm base and forms a small proportion of the total area farmed. Low impact.  Severance: holding severed but accessible from public highway. Medium impact.

<sup>14</sup> Volume 5: Appendix CT-003-000



Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
	CoCP. Negligible impact	Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: moderate effect due to the proportion of the holding required and severance	Overall permanent assessment: moderate effect due to the proportion of the holding required and severance
CFA07/3  Denham Park Farm  Current size 126ha. Planning permission has been granted for gravel extraction over approximately 41ha and will reduce temporarily the size of the holding to 85ha  Medium sensitivity to change	Land required (excluding 16.5ha already required for gravel extraction): 14.3ha (11%) of holding. Medium impact.  Severance: holding severed but accessible from public highway. Medium impact.  Disruptive effects: construction noise and dust controlled via the mitigation measures set out within the draft CoCP. Negligible impact	Land required: 12.2ha (13%). Medium impact.  Severance: holding severed but accessible from public highway. Medium impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: moderate effect due to the proportion of the holding required and severance.	Overall permanent assessment: moderate effect due to the proportion of the holding required and severance.

## 5 References

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